REMARKS/ARGUMENTS

Reconsideration is respectfully requested of the Final Official Action of May 7, 2009, relating to the above-identified application.

A two-month extension of time, together with the associated fee, is filed herewith.

The claims in the case are 1 to 6, 9, 12 to 17, 19, 20, and 23 to 28. Claims 14 to 17, 19, 20, 23 and 24 stand withdrawn from further consideration as being directed to a non-elected invention. Claim 14 is proposed to be amended by the foregoing After-Final amendment to incorporate the definition of the exhaust treatment device from Claim 1 in order so that method claims can be re-joined upon allowance of the claims to the exhaust treatment device. Rejoinder of all method claims is requested. New Claims 27 and 28 are discussed hereinafter.

In one aspect, the present invention relates to an exhaust treatment device which is formed of a substrate and a 1-catalyst layer deposited on the substrate. The catalyst layer itself comprises a first catalytic metal, preferably palladium, and as the second catalytic metal, preferably rhodium.

A number of important features characterize the single layer catalyst which is deposited on the substrate. The first and second catalytic metals, oxygen storage material and support material such as aluminum oxide are combined to form a slurry which typically is then deposited as a washcoat on the substrate to form a washcoated substrate; see [0008] and [0031]. Another feature of the present invention is that 70 wt.% or more of the first catalytic metal and the second catalytic metal are present in the exhaust treatment device of the invention in a non-alloyed state

and wherein the weight percent is based on the combined weight of the first and second catalytic metal. See [0006] and [0031].

In addition to the palladium as first catalytic metal and the rhodium as second catalytic metal as defined above, there may also be present an additional catalyst metal selected from the group consisting of platinum, iridium, ruthenium and osmium. See [0006].

The aluminum oxide is preferably gamma aluminum. The oxygen storage component (OSC) contains cerium in combination with other materials; see [0044]. The aluminum oxide and the OSC have average pore diameters of about 150 Angstrom to about 1,000 Angstrom and where the OSC component is represented by the formula:

$Ce_aZr_bLa_cY_dPr_eO_x$, see [0042] and [0045].

As a result of this single, 1-layer catalyst design, the advantage of a more simple catalyst design compared to the 2-layer catalyst is achieved; see [0032].

Unlike conventional 2-layer catalyst designs, the catalyst of the invention is a single layer catalyst capable of preventing Pd-Rh interaction; i.e., preventing alloy formation. As such, the 1-layer catalyst is capable of maintaining its palladium function and its rhodium function; see [0033].

It is further important to note that the single catalyst layer can be deposited from a slurry containing the combined loading of first and second catalytic metals onto the substrate so that the palladium and rhodium, and any other catalyst metals are combined as a mixed layer of Pd/Rh on

the substrate; see [0037] and [0074]. The mixed layer is formed from the slurry comprising the palladium salt, rhodium salt, a support (e.g. aluminum oxide) and oxygen storage component.

In this mixed layer, the first and second catalytic metals and any other catalytic metals are combined with no effort being made to chemically fix or otherwise separate the precious metals; see [0040]. The advantages of the single mixed layer are described also in para. [0074]. A uniform catalyst layer is achieved in this way.

These features of the present invention establish the critical distinction with respect to the prior art of record for reasons to be explained in more detail hereinbelow.

The rejection of Claims 1 to 6 and 9 under 35 U.S.C. § 103(a) as unpatentable in view of the U.S. patent of *Sung*, U.S. 5,981,423 taken with the *Fujitani* patent, U.S. 4,239,656 is traversed and reconsideration is respectfully requested.

The Final Action of May 7, 2009 describes the *Sung* patent as showing an exhaust treatment device containing a substrate and a one-layer catalyst deposited on the substrate where the catalyst layer is formed of a first catalytic metal such as palladium (Pd) and a second catalytic layer such as rhodium (Rh) wherein greater than or equal to about 70% of the first and second catalyst metals are non-alloyed under alloying conditions.

In response, applicant respectfully submits that *Sung* does not at all disclose the subject matter claimed here as represented in the Final Action. First, it is necessary to clarify the nomenclature: a substrate means an inert inorganic substance such as a honeycomb, while a

support is usually a catalytically active high surface area material such as aluminum oxide. The latter is a component of the "washcoat" in this invention. The washcoat comprises the catalytic metals which is deposited on the inert substrate.

Sung describes his catalyst in col. 6, lines 41, *et seq.*, as comprising a first support with the first precious (catalytically active) metal and a second support with a second precious (catalytically active) metal.

The first and second supports of *Sung* can be chemically the same or different and can be a material such as aluminum oxide (alumina); see col. 7, lines 38-41. What is critical for *Sung* is that the particle size of his first and second supports is different, as is pointed out below. Hence, in that way the supports of *Sung* are different; and contrary to what is said in the Final Action, the supports of *Sung* are not the same.

Sung describes his catalyst in col. 8, beginning at line 25 and says that his layer is supported on a substrate. The layer has an upper half and a bottom half. Greater than 50 wt% of the first support and first precious metal is located in the bottom half of the layer. And greater than 50 wt% of the second support and second precious metal is located in the upper half of the layer. Thus *Sung* teaches that his layer of catalyst has greater than 50wt% of the first precious metal in the bottom half and greater than 50wt% of the second metal in the upper half. *Sung* specifically points out that segregation of the components with the upper and lower half of the layer can be achieved in this way; see col. 8, lines 65-67. It is therefore clear that *Sung* does not have a mixed layer as defined by applicant's claims with no separation of precious metals.

Sung emphasizes that his support for the first precious metal and the support for the second precious metal have different particle sizes thereby enabling the gradient of precious metals in the catalyst layer. See col. 6, beginning at line 41 where *Sung* shows that the average particle size of the second support is greater than the average particle size of the first support. The result of this difference in particle size of the support is described in col.7 beginning at line 1. Thus a concentration gradient across the thickness of the layer is obtained to achieve the segregation that *Sung* desires. See, col.7 lines 9-12. It is therefore apparent that the use of first and second supports of different particle sizes is critical for *Sung's* invention in order to segregate the precious metals.

Applicant's claims distinguish from *Sung* by defining applicant's catalyst layer as comprising palladium as the first catalyst metal and rhodium as the second catalyst metal where the palladium and rhodium as present as a combined loading on a support to form a mixed layer of Pd/Rh on the substrate. Basis is found, inter alia, [0037] and [0074]. The support for applicant's first catalyst metal and second catalyst is not only chemically the same; <u>there is no difference in particle size</u>. The result is that in applicant's invention the first and second catalyst metals are mixed together, not segregated, to create a mixed layer. *Sung* does not have his two metals as a combined loading on the same support to form a mixed layer of Pd/Rh. *Sung* has two distinct supports because of the difference in particle sizes and hence his loading is not of a combination of the metals on the support, but rather separate loadings on physically different supports to form a segregated layer instead of a uniform layer such as applicant's layer.

While *Sung* takes special measures to segregate his first and second catalytic metals by controlling particle size, applicant has, to the contrary, made no effort to separate the precious metals [0040]. The result is that applicant uses a combined loading of the precious metals to form a mixed layer instead of a layer having a gradient layer as described by *Sung* in col. 8, lines 25-42.

A careful review of the *Sung* patent shows that it discloses a single layer which contains Pd on separate first support and Rh on a separate second support, wherein the two supports differ in particle size. *Sung* notes that the palladium and rhodium alloy formation will occur with detrimental effects; see col. 9, lines 50 to 55 and col. 13, lines 6 to 12.

The improvement alleged by *Sung* relating to overcoming this problem is explained by *Sung* in col. 7, lines 1 to 38 and col. 8, lines 25 to 67. This is said to be accomplished by generating a clear bi-modal distribution of support particle sizes for separating the palladium and rhodium metals.

Sung teaches in col. 8, lines 43, *et seq.*, that a separate slurry is prepared for the first precious metal and its own support and a separate slurry is prepared for the second precious metal on its own support. The two slurries are then combined and deposited on the substrate. In contrast, the support used by applicant does not have a bi-modal distribution; i.e. applicant's support does not have the particle differences required by *Sung*.

According to *Sung*, palladium is selectively put on the smaller particle sized support and, thus, will segregate to the bottom of the layer during coating and the rhodium is on the larger

particle sized support and will segregate to the top of the layer. Thus, following the teachings of *Sung*, there is obtained a type of separation as in a 2-layer catalyst wherein palladium is in the first or bottom layer and rhodium is in the top or second layer. See, for example, col. 7, lines 1 to 18.

This type of product requires separate milling of the palladium and the rhodium slurries. In one case, the palladium is prepared and fixed to one slurry, milled to a smaller particle size of 90% being less than 10 microns (see example 1, column 20, lines 34 to 40) and then adding the rhodium slurry and milling further to reduce the rhodium support to 90% being less than 25 microns. Alternatively, one can mill each slurry separately and finally combine them as the final coating slurry. Examples 3 and 4 of the *Sung* patent show that slurries are milled separately and finally combined to give a single coating slurry.

Sung admits that separation of the Pd and Rh using different supports and particle sizes is critical. In the present application no effort is made to separate the PGM by particle size differences and, in fact, applicant specifically avoids having different particle sizes for the Pd and Rh supports.

A brief review of the respective coating processes shows the differences:

i) The *Sung* coating: This coating uses what is called a metered charge process. A fixed charge of slurry is delivered to a pan shaped holder in the coater and then the coater delivers <u>all</u> the slurry into the part, such as a honeycomb carrier. The slurry partially fills the honeycomb part, usually half. The honeycomb part is then rotated and the other half/section of

the raw honeycomb part is coated. The critical point is that all of the slurry delivered for coating is applied to the honeycomb part and nothing is returned to the main feed tank.

ii) Applicant's process: In this process the honeycomb part is lowered into a feed tray with excess slurry. A portion of this slurry is drawn into the honeycomb part using a vacuum and the honeycomb part is partially filled but with excess slurry. The honeycomb part is rotated and a vacuum is applied to the other end and excess slurry is pulled out and re-cycled for further use. The wash coat loading is defined by the fill gram (amount pulled into the parts), specific gravity, viscosity etc and the level of vacuum clearing. One clear effect of this coating method is that during clearing the slug of slurry is being pulled through a dry section of the honeycomb part. As the slurry exits the honeycomb part, water is being pulled out of slurry as well as **fine particles** and of coarse water and solubles. Thus, for the slurry that is exiting the honeycomb part a much higher solid content and a significant depletion of fines in the slurry is obtained. The amount of slurry that is pulled out depends on many parameters such as fill gram and porosity of the substrates. Typical substrates have up to 30% porosity. As a result of this, applicant intentionally designs his slurries so that the particle sizes and distributions that support the Pd and Rh are as identical as possible. Otherwise, one would have selective separation of Pd and Rh during coating and putting the Pd on fines as in the *Sung* patent will completely foul up the coating process. What will happen is that in the beginning of coating applicant selectively put Pd on the honeycomb parts and as one progresses through the process Pd depletes in the tank and then Rh will selectively be put on the honeycomb parts.

The *Sung* patent fails to show performance from a true reference catalyst where the particle sizes are the same for the supports used for Pd and Rh so alloy formation could occur as *Sung* said it would. *Sung* did not measure by XRD if alloy formation occurred. *Sung* also did not do full separation of the Pd and Rh supports in a two layer design with the same total wash coat load as applicant did in Figures 2 - 4 so as to prove that the performance is the same for the single layer design of his invention. Thus, there is no data in the *Sung* patent whatsoever to show that *Sung* got reference performance values for a Pd/Rh segregated design or for a design where Pd and Rh interact and form alloys. Applicant has shown that applicant gets performance identical for a 2-layer design (Figures 2 – 4) with the same wash coat loading and overall wash coat composition. *Sung* also did not show SEM or other data indicating separation of the Pd and Rh wash coat components by their preparation method.

The Official Action alleges that it would have been obvious to a person having ordinary skill in the art at the time of the invention to replace the supports of *Sung* with the supports found in the *Fujitani* patent. However, it should be noted that *Sung* requires that each of the precious metal components have its own support and that each support has a different particle size. Consequently, a person skilled in the art would not necessarily conclude that both precious metals of *Sung* should be placed on the single support of *Fujitani*. Two different supports for the two different precious metal components shown in the *Sung* patent are described, beginning in col. 6, at line 40. *Sung* specifically teaches that the particle size must be different for the two precious metals and, therefore, a person skilled in the art would not be lead to replace the two

different supports of *Sung* with the particular support of *Fujitani*, which is a single support. The *Fujitani* support does not have two different particle sizes. Therefore, a person skilled in the art with the knowledge of these two references would not be lead to the conclusion that the two different supports of *Sung* should be replaced with the single support of *Fujitani*. Thus, the two references are not compatible and have divergent teachings which would not lead a person skilled in the art to follow the proposal set forth in the Official Action. Consequently, applicant respectfully submits that the combination of references does not create *prima facie* obviousness of the claimed invention.

With respect to Claims 3-6 and 9, the comments made apply here as well. The references fail to create *prima facie* obviousness of the claimed invention.

As further evidence of the differences between the present invention and the prior art, the Declaration of John Nunan is filed herewith.

The Figures 1 to 3 show the improvement in conversion obtained when using a washcoated with a pore size in the range of 150Å to 1000 Å.

Figures 4, 5 and 6 demonstrate that applicant obtains a uniform distribution of the catalytic metal throughout the washcoat.

Figures 7 and 8 are further evidence of the uniform distribution of catalytic metal in applicant's washcoat.

The evidence clearly shows that, unlike the segregated coatings of the prior art, applicant obtains a uniformly distributed catalytic metal in his washcoat contrary to the expectations of the prior art teachings.

Applicant's invention featuring the non-segregated washcoat is therefore contrary to the teachings of the prior art and hence is a patentable invention.

The rejection of Claims 12 and 26 under 35 U.S.C. § 103(a) as unpatentable over *Sung, et al.*, taken with *Fujitani* and further in view of *Anatoly, et al.*, US 6,387,338 (of record), is traversed and reconsideration is respectfully requested.

Claim 12 is dependent on Claim 1 and differs therefrom by specifying the chemical composition of the oxygen storage components. Claim 26 is dependent on Claim 1 and specifies more particular values of the subscripts for the oxygen storage material of formula 1. It has already been explained that the combination of *Sung* and *Fujitani* does not create *prima facie* obviousness for the claimed subject matter of Claim 1 and, therefore, the same arguments apply with respect to Claims 12 and 26.

The addition of *Anatoly* does not fulfill the shortcomings of the combination of references and, consequently, applicant respectfully submits that a person skilled in the art would not be lead to the claimed invention from a thoughtful consideration of the teachings of the references.

The rejection of Claim 13 under 35 U.S.C. § 103(a) in view of *Sung* taken with *Fujitani* and further in view of *Suzuki*, US 6,335,305 is traversed and reconsideration is respectfully

requested. Claim 13 depends on Claim 1 and differs therefrom by specifying that the oxygen storage component has a stable cubic structure.

The shortcomings of the *Sung* and *Fugitani* references have already been discussed above and those comments apply here as well.

Applicant respectfully submits that even if the teachings of *Suzuki* were combined with those of the principal references, the resulting combination of teachings would not lead to the present invention. Consequently, it is respectfully submitted that the rejection of Claim 13 is not well-founded and should be withdrawn.

The rejection of Claim 25 under 35 U.S.C. § 103(a) in view of *Sung*, *Fujitani* and *Foster* U.S. 5,857,140 is traversed and reconsideration is respectfully requested.

Claim 25 is directed to an exhaust treatment device comprising a substrate and a catalytic layer and differs from Claim 1 by specifying that it also includes a retention material disposed around the substrate to form a subassembly and a housing disposed around a subassembly.

The *Foster* patent is relied on to show a retention material and a housing. However, the combination of references does not establish *prima facie* obviousness of the claimed invention because the principal references of *Sung* and *Fujitani* are actually incompatible with each other for the reasons explained above. The rejection of Claim 25 should therefore be withdrawn.

Consequently, a person skilled in the art would not be lead to the present invention by a consideration of the references relied on in the Official Action.

With respect to new Claims 27 and 28, *Sung* fails to show all of the conditions set forth in those two claims. Moreover, *Fujitani* fails to suggest that the catalysts of *Sung* could be improved in any way by further modifications of the teachings of *Sung*. Applicant respectfully submits that the combination of *Sung* and *Fujitani* fails to create *prima facie* obviousness of the invention defined in Claims 27 and 28.

The rejection is deemed to be improper and therefore, withdrawal thereof is respectfully requested.

Favorable action at the Examiner's earliest convenience is respectfully requested.

Respectfully submitted,

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